REMARKS

Claims 1-50 are pending in the application and are rejected. A previously submitted preliminary amendment and the abstract of the disclosure are objected to.

Abstract of the Disclosure

The abstract of the disclosure is objected to because it contains more than 150 words.

In response, Applicants amend the abstract as shown above and request reconsideration. A clean version of the abstract that results from entry of this amendment is enclosed.

Preliminary Amendment

A preliminary amendment submitted on April 25, 2005 is objected under 35 U.S.C. § 132(a) for introducing new matter. Referring to pages of the preliminary amendment, the Office Action indicates the following amendments introduce new matter and must be canceled: (1) last paragraph on page 17; (2) equation (20) on page 18; (3) equation (35) on page 22; (4) equation (39) on page 23; and (5) equations (62), (63) and (64) on page 50.

Applicants respectfully disagree. The subject matter in the paragraph and the equations that are objected to is not new matter because it merely corrects obvious errors. The original disclosure contains errors that will be apparent to those having ordinary skill in the relevant arts. The changes that are needed to correct these errors also will be apparent to those having ordinary skill in the art because they are based on information that is either known from the prior art or is set forth in the original disclosure. The objected to subject matter reflects these changes.

Last Paragraph on Page 17

The last paragraph on page 17 that is objected to inserts text near the end of a paragraph in the original disclosure that begins in line 23 on page 39. The original paragraph discusses how a controller can estimate the back electromotive force (BEMF) term in equation (18) and subtract a linear part of the estimate from a voltage signal V_{audio} representing audio information. This discussion explains how the differential equation (18) can be converted into a simpler algebraic expression such as that shown in original equation (20).

The conversion from a differential equation to an algebraic equation is based on a well-known area in the field of control theory called "singular perturbations." This conversion relies on certain terms in the differential equation being small enough that they can be ignored. A person of ordinary skill in the art would recognize that the only way to arrive at an algebraic expression like

that shown in original equation (20) would be to ignore the inductive EMF term $L_e(x)=\frac{di}{dt}$ in equation (18), which is possible because the inductance $L_e(x)$ is known to be small in many cases of interest. The text added by amendment merely makes explicit what is already implicit in the original disclosure. This text reads as follows:

> In many cases of interest the effective coil inductance $L_e(x)$ in equation (18) is very small. If we neglect this inductance, the inductive EMF term $L_e(x)=\frac{di}{dt}$ in equation (18) disappears, and that differential equation becomes an algebraic equation. With this simplification, the voltage signal that is output from the control circuit to the voice coil in order to compensate for the nonlinear BEMF is:

This situation would be apparent despite the error in equation (20), which is discussed next.

Equation (20)

The original paragraph that bridges from page 39 to 40 in the original disclosure explains how the differential equation (18) is converted into the algebraic equation (20). A person of ordinary skill in the art who followed the described procedure would discover original equation (20) is not correct. The correct equation (20) is obtained by a straight-forward application of what is explained in the original text.

According to the text in lines 4-13 on page 40:

> … A linear BEMF term can also be calculated and subtracted from the voltage representing the audio information, in order to provide damping if required. The subtracted linear part of the BEMF is chosen such that the effect of the subtraction is to electronically add back a positive constant to the mechanical drag coefficient R_{ms} in equation (19). This positive constant is some adjustable fraction, p, of the Thiele-Small small-signal BEMF contribution to the drag coefficient that would arise due to the equilibrium value $Bl(0)$ without any correction. …

It may be seen from equation (18) that the positive constant, which is an adjustable fraction of the BEMF contribution as described above, is of the form $-pBl(0)\dot{x}$. As a result, the current in the BEMF term $Bl(x)i(t)$ is of the form $i(t)=-p\frac{Bl(0)}{Bl(x)}\dot{x}$. By substituting this expression for current into equation (18) and ignoring the inductive EMF term as explained above, it may be seen that equation (18) can be expressed as:

$$V_{coil} - Bl(x)\dot{x} = -R_e p \frac{Bl(0)}{Bl(x)} \dot{x}$$

$$V_{coil} = Bl(x)\dot{x} - R_e p \frac{Bl(0)}{Bl(x)} \dot{x}$$

The original text in lines 1-4 on page 40 explains that the estimated BEMF is corrected by having the control circuit add it to the voltage representing the audio information, which is denoted by the symbol V_{audio}. This correction can be expressed as:

$$V_{coil} = qV_{audio} + Bl(x)\dot{x} - R_e p \frac{Bl(0)}{Bl(x)} \dot{x} \qquad (\#1)$$

where the constant q represents the same amount of correction applied to the voltage that is also applied to the drag term, as explained in the original text. It can be seen from the discussion above that this constant is $\frac{Bl(0)}{Bl(x)}$; therefore, the equation (#1) can be rewritten as:

$$V_{coil} = \frac{Bl(0)}{Bl(x)} V_{audio} + Bl(x)\dot{x} - R_e p \frac{Bl(0)}{Bl(x)} \dot{x}$$

which can be rearranged to read as follows:

$$V_{coil} = \frac{Bl(0)}{Bl(x)} V_{audio} + \left(Bl(x) - p R_e \frac{Bl(0)}{Bl(x)} \right) \dot{x} \qquad (20)$$

This is the corrected form of algebraic equation (20) that was submitted by preliminary amendment.

Equation (35)

The original text in lines 9 to 12 on page 47 describes an implementation in which "a choice is made to simultaneously implement all of the previously described modular corrections: the BEMF correction in equation (20), the inductive correction in equation (22), and the transduction corrections in equation (34)." The original text describes one way in which all of these corrections can be made and further indicates this combined correction is expressed in equations (35) and (36). A person of ordinary skill in the art who followed the described procedure would discover original equations (35) and (36) are not correct. The correct equations can be obtained by a straight-forward combination of the preceding corrections in which the BEMF terms are expressed as explained above for equation (20).

This process results in the changes shown below. The original equations

$$u_1(t) = S(x) + wB(x) + (Bl(x) - p\,Bl(0)^2 / Bl(x))\,\dot{x}(t) \qquad \text{(original 35)}$$

$$u(t) = u_1(t) + \frac{L_e(x)}{R_e}\dot{u}_1(t) \qquad \text{(original 36)}$$

when corrected, become the following amended equations:

$$u_1(t) = S(x) + wB(x) - pR_e\frac{Bl(0)}{Bl(x)}\dot{x}(t) \qquad \text{(amended 35)}$$

$$u_V(t) = u_1(t) + \frac{L_e(x)}{R_e}\dot{u}_1(t) + Bl(x)\dot{x} \qquad \text{(amended 36)}$$

These are the corrected equations that were submitted by preliminary amendment.

Equation (39)

Equation (39) submitted by preliminary amendment is a correction to original equation (37), which read as follows:

$$u_1(t) = S(x) - \frac{q\,xK(0)}{Bl(x)} + wB(x) + (Bl(x) - p\,Bl(0)^2 / Bl(x))\,\dot{x}(t) \qquad \text{(original 37)}$$

Original equation (37) follows directly from original equation (35) by adding the term $-\frac{q\,xK(0)}{Bl(x)}$ to the right-hand side of the expression. Adding this term to the right-hand side of the corrected equation (35) results in the following expression:

$$u_1(t) = S(x) - \frac{q\,xK(0)}{Bl(x)} + wB(x) - pR_e\frac{Bl(0)}{Bl(x)}\dot{x}(t)$$

This is equation (39) that was submitted by preliminary amendment.

Equations (62) to (64)

Equations (62) to (64) submitted by preliminary amendment are corrections to original equations (57) to (59), which read as follows:

$$BEMF = (K_{V1}\,Bl - K_{V2} / Bl)\,\hat{\dot{x}}(t) \qquad \text{(original 57)}$$

$$V_1(t) = S + V_{audio}(t) / Bl + BEMF \qquad \text{(original 58)}$$

$$V_{coil}(t) = V_1(t) + (K_{I1}\,L_e - K_{I2}\,L_0)\,(V_1(t) - V_1(t-\tau)) \qquad \text{(original 59)}$$

Original equations (57) and (58) correspond to equation (35), and original equation (59) corresponds to equation (36). Different notations are used in equations (57) to (59) to maintain consistency with the associated text in the disclosure. For example, the voltage denoted by $u_1(t)$ in equations (35) and (36) is denoted by $V_1(t)$ in equations (58) and (59). The principal difference between equations (35) and (36) and original equations (57) to (59) is that the derivatives of

position and voltage appearing in equations (35) and (36) are replaced by numerically computed approximations. Original equations (57) and (59) contain the velocity estimate $\hat{\dot{x}}(t)$ rather than the actual velocity $\dot{x}$ appearing in equations (35) and (36). Equation (59) uses the approximate voltage derivative $(V_1(t)-V_1(t-\tau))$ rather than the actual derivative $\dot{u}_1(t)$ appearing in equation (36).

The original equations (57) to (59) contain errors that are the result of the errors that existed in original equations (35) and (36). After correcting equations (35) and (36) as discussed above, the appropriate content of equations (57) to (59) is readily apparent. This can be seen either by deriving again these equations from corrected equations (35) and (36) or by applying the same corrections to original equations (57) to (59) as discussed above for equations (35) and (36). Either approach is valid. The corrected equations read as follows:

$$BEMF = -(K_{V2} / Bl)\ \hat{\dot{x}}(t) \quad \text{(new 62)}$$

$$V_1(t) = S + V_{audio}(t)\ Bl_0 / Bl + BEMF \quad \text{(new 63)}$$

$$V_{coil}(t) = V_1(t) + K_{I1}\ L_e\ (V_1(t) - V_1(t-\tau)) + K_{V1}\ Bl\ \hat{\dot{x}}(t) \quad \text{(new 64)}$$

Referring to equation (64), it is readily apparent to one of ordinary skill in the art that the last term $K_{I1}\ L_e\ (V_1(t)-V_1(t-\tau))$ in the equation is a correct expression for a numerically calculated approximation of the derivative of the voltage appearing in equation (36) and that the original expression $(K_{I1}\ L_e - K_{I2}\ L_0)\ (V_1(t)-V_1(t-\tau))$ in original equation (59) is not correct.

Rejection of Claims Under § 101

Claims 1-3 are rejected under 35 U.S.C. § 101 for being directed toward non-statutory subject matter.

Applicants cancel claims 1-3 among other claims as shown above.

Rejection of Claims Under § 102

Claims 1-3, 20-26, 43-44 and 48 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. patent 4,041,249 (referred to as "Matz"). Of these claims, claims 1 and 23 are independent and the remaining claims are dependent. Independent claim 1 is canceled. Claim 23 is the only independent claim that remains in the application.

Applicants respectfully traverse the rejection of claim 23 as originally submitted. Applicants amend claim 23 as shown above and as explained below but these amendments are not made in response to the Office Action. The reasons for traversal discussed below refer to original claim 23.

Original claim 23 reads as follows (letters are added to the claim steps for convenient reference in the following discussion):

23. A process for controlling an audio reproduction system of a telephony device which includes a sound transducer, the process comprising:

(a) preparing a model of the sound transducer portion of the audio reproduction system;

(b) providing a control circuit having first and second inputs;

(c) configuring the control circuit as a function of the model;

(d) providing an audio signal to the first input;

(e) providing to the second input a signal which is indicative of a state of the sound transducer; and

(f) utilizing the control circuit to generate an output signal which is a function of the signal indicative of a state of the sound transducer and the audio signal.

Applicants wish to make an initial comment that Matz does not appear to be very relevant to the claimed invention. They question whether the claimed invention has been classified correctly.

Matz discloses a central dictation system. In the disclosed system, a plurality of dictating stations are capable of communicating with any one of a plurality of central record/playback stations, and each of a plurality of transcribing stations are connected to respective ones of the record/playback stations (col. 3 lns. 24-33). A dictating station connects with a central station to record and playback a message. When the dictating station stops communicating with a central record/playback station, that central station records a predetermined code immediately after the dictated message (col. 3 lns. 33-36). This code is used by the system to prevent someone at another dictating station from listening to the dictated message (col. 3 lns. 37-40).

Applicants respectfully traverse the rejection of original claim 23 because Matz does not disclose or suggest steps (a), (b), (c), (e) or (f) of the claim. Each of these steps is discussed below.

Step (a)

The Office Action indicates this step of preparing a model is disclosed in Matz in the text that appears in col. 6 lns. 27-38.

Applicants respectfully disagree because Matz does not disclose or suggest any model of a sound transducer. The cited text in col. 6 describes conventional microphones and loudspeakers in a headset that are part of the dictating station. Applicants agree the disclosed loudspeakers are sound transducers but they believe it should be very clear there is nothing in Matz that discloses or suggests a model of a sound transducer.

If it is still believed Matz discloses a model of a transducer, Applicants respectfully request that the next communication explain what is thought to be the model.

Step (b)

The Office Action indicates this step of providing a control circuit with two inputs is disclosed in Matz by the provisioning of the transcription scan control (200) with the filter (202) and the tone generator (246).

Applicants respectfully disagree because the control (200) does not have two inputs. The scan control (200) detects recorded code signals and identifies recorded messages. A signal representing the recorded code is received through the filter (202) as explained in col. 15 ln. 63 to col. 16 ln. 1. Applicants agree the filter (200) is an input; however, the tone generator (246) is not an input to the scan control (200). Instead, it is an output that notifies an operator that the recorded code has been detected (see col. 16 lns. 23-33). Applicants are unable to find anything that could correspond to the claimed second input.

If it is still believed that scan control (200) is the claimed control circuit, Applicants respectfully request careful consideration of what is regarded to be the second input.

Step (c)

The Office Action indicates this step of configuring the control circuit as a function of the model is disclosed in Matz in Fig. 3 and in col. 15 lns. 49-62.

Applicants respectfully disagree. The cited text explains the transcribe scan control circuit (200) detects recorded code signals and identifies recorded messages. The Office Action does not explain how this circuit (200) is configured as a function of whatever transducer model is alleged to be disclosed in col. 6. Applicants respectfully submit it is not.

If it is still believed Matz discloses configuring circuit (200) according to some transducer model, Applicants respectfully request that the next communication explain what configuring is done.

Step (e)

The Office Action indicates this step of providing to the second input a signal indicative of sound transducer state is disclosed in Matz in Fig. 3 and in col. 15 lns. 49-62.

Applicants respectfully disagree. The cited text describes details of a circuit that generates a pulse in response to the detection of a recorded code, as discussed above. The pulse is used to drive the tone generator (246), which provides notification to an operator that a recorded code has been detected (col. 16 lns. 6-33).

These aspects disclosed in Matz do not appear relevant to what is claimed. As mentioned above, the tone generator is not directly associated with any input to the circuit (200) but is instead

an output. In addition, there is no disclosure or suggestion of any signal that is indicative of a state of the sound transducer that is allegedly modeled by something disclosed in col. 6.

If it is still believed Matz discloses providing to the second input a signal which is indicative of a state of the sound transducer, Applicants respectfully request that the next communication explain each of the following: (1) what is deemed to be the second input of the claimed control circuit; (2) what is the claimed signal; (3) what sound transducer is represented by the signal; and (4) what state of this transducer is represented by the signal.

Step (f)

The Office Action indicates this step of utilizing the control circuit is disclosed in Matz in col. 16 lns. 23-33 and col. 18 lns. 4-14.

Applicants respectfully disagree. The cited text describes details of the transcribe scan control (200), particularly with respect to the detection of recorded codes and the control of a tape transport. According to the claim, the control circuit generates an output signal as function of the audio signal (which is alleged to be the signal from filter 202 obtained from the recorded codes as mentioned above) and the signal indicative of state of the sound transducer (which is alleged to be the signal to or from the tone generator 246). As mentioned above, the tone generator (246) is related to an output signal rather than an input signal and it is not indicative of the state of the sound transducer.

If it is still believed Matz discloses this last step, Applicants respectfully request that the next communication explain what is deemed to be the claimed output signal and how this output signal is a function of whatever is deemed to be the signal indicative of transducer state.

Dependent Claims

All other claims that are remaining in the application, including those claims rejected under 35 U.S.C. § 103(a) in view of additional prior art, are dependent on claim 23 and add further limitations. Applicants are not submitting detailed discussions of the dependent claims because they believe the reasons presented above for independent claim 23 are sufficient to traverse their rejection; however, they do wish to express that for each dependent claim either the various features of the dependent claims are not disclosed as alleged in the Office Action or there would not have been a motivation to combine references, contrary to what is expressed in the Office Action.

Claim Amendments

Applicants amend the claims as shown above to simplify the recited language and to remove limitations where appropriate. A modified form of the limitation appearing in claim 24 is added to claim 23. Some claims have been canceled because they are duplicative after amendment.

The claims that result from entry of these amendments are provided below in a clean form as a convenience to the Examiner for considering the amended claims.

CONCLUSION

Applicants amend the application and request reconsideration in view of the discussion set forth above.

Respectfully submitted,

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Certificate of Transmission

I certify that this Response to Office Action and any following materials are being transmitted by facsimile on September 11, 2006 to the U.S. Patent and Trademark Office at telephone number (571) 273-8300.

David N. Lathrop

Enc. Amended abstract in a clean form
Amended claims in a clean form